ABSTRACT OF THE DISCLOSURE

A nonreciprocal optical element and method for operating it to effect separate control of intensity and phase (or optical path length) of counter propagating beams over a very wide range. The nonreciprocal optical element includes a circulator for routing a first signal from a first port to a second port and a second signal from the second port to a third port, a third signal from the third port to a fourth port and a fourth signal from the fourth port to the first port; a first mirror for reflecting a signal output by the second port back into the second port; and second mirror for reflecting a signal output by the fourth port back into the fourth port. Polarization rotation elements such as quarter-wave plates are disposed between the mirrors and the second and fourth ports to preserve the polarization of the input beams. Filters are disposed between these ports and mirrors to adjust the transmittance of the input and output signals. An arrangement is included for translating the positions of the mirrors relative to the ports to adjust the phase of the output signals. Independent spectral control is effected by providing a Bragg grating, interference filter or other spectral filter between the second or fourth ports and the mirror associated therewith.